

students. One shudders at the thought of a student attempting to commit to memory such a mass of detailed information as is compressed into this volume. It has developed into a portable book of reference, and as such is eminently useful and trustworthy for filling up gaps in one's knowledge as occasion requires.

Whilst deprecating the use of books of this type as class text-books, we do not share the feeling expressed by some that the bulk of new facts accumulated year by year in organic chemistry have little or no value, or that the motives which lead to their production are unworthy. The worst that can be said of multiplying compounds is that, without adding anything to the complexity of the subject, they fill in, as it were, the missing blocks in the picture puzzle, and merely complete what was anticipated; and as to the motives of those who produce them it may be pointed out that much of the research work of the compound-making type is done by young chemists as an exercise in that kind of skilful manipulation which counts for so much in every branch of chemical investigation, and for which organic chemistry seems so exceptionally well fitted.

J. B. C.

### THREE FISH-FAUNAS.

- (1) *Catalogue of the Fresh-water Fishes of Africa in the British Museum (Natural History)*. Vol. i. By G. A. Boulenger. Pp. xi+373; illustrated. (London: Printed by Order of the Trustees; sold by Longmans, Green and Co., and others, 1909.) Price 32s. 6d.
- (2) *The Fishes of Illinois*. By S. A. Forbes and R. E. Richardson, Nat. Hist. Survey of Illinois. Vol. iii., Ichthyology. Pp. cxxxi+387; plates, maps to accompany above, pp. 103. (Illinois, n.d.)
- (3) *Andrew Garrett's Fische der Südsee*. Part viii. By A. C. L. Günther, Hamburg, Journ. Museum Godeffroy, vol. xvi. Pp. iv+261-388; plates, 141-160. (Hamburg: L. Friederichsen and Co., 1909.) Price 60 marks.

(1) **T**HE zoological survey of the Nile, undertaken by the Egyptian Government during the administration of Lord Cromer, and the explorations of the great Central African lakes, initiated in that country, together with those of the Congo, carried out by the Belgian authorities, have resulted in an enormous expansion of the collection of African fresh-water fishes preserved in the Natural History branch of the British Museum. That collection, moreover, as we are informed in the introduction to the first of the three works forming the subject of the present notice, contains a very large proportion of the type-specimens of the many new species which have been described as the result of the aforesaid explorations. It was, therefore, from all points of view highly desirable that a descriptive catalogue of this vast collection should be published, as such a work will serve as a basis for the discussion of the many points relating to the distribution and origin of the African fish-fauna, and likewise as a book of reference for workers in Africa itself, from which it can readily be ascertained whether specimens belong to already described species.

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Mr. Boulenger, to instance only his volume on those of the Congo, published by the Government of the Congo Free State, has already devoted much study to African fresh-water fishes, and for this reason, coupled with his official position at the Museum, he was obviously the man to undertake the laborious task of writing this catalogue, which, it is considered probable, will run to three volumes.

The present volume, at all events to others than ichthyological specialists, will probably prove the most interesting of the three, as it includes some of the most distinctive and aberrant types of the African fish-fauna. To many naturalists it will be of special interest to learn that a shark (*Carcharias zambesiensis*) inhabits the Zambesi at a distance of 120 miles from its mouth, and also that a saw-fish ascends this and probably other African rivers to a considerable distance. Of the characteristic and peculiar Ethiopian types, two of the most remarkable are the bichirs (*Polypterus*) and Calamoichthys, the sole survivors of the fringe-finned ganoids, and the mud-fish (*Protopterus*). No fewer than ten species of bichir are now recognised, although the allied genus is still represented by a single known member; and there are two kinds of mud-fish.

Next in point of interest to these ancient types are the remarkable fishes forming the exclusively Ethiopian family Mormyridæ, many of the members of which display such extraordinary vagaries in the matter of beak-development—a development which has suggested for the group the not inappropriate name of elephant-fishes. Of these strange fishes eleven generic types are now admitted, some of which, such as Mormyrops (with thirteen), include a large number of species. It may be hoped that before long the author will take an opportunity of giving us his views as to the origin of this family, which, if determinable, will add considerably to our knowledge of the origin and relationships of the African fauna generally.

The other important family treated in this volume is the Characinidæ, which has a distribution similar to that of the Lepidosirenidæ, being common to Africa and Central and South America. The number of African genera admitted in the volume before us is twenty. The characinids, like the lepidosirenids, have been frequently quoted as affording evidence in favour of a land connection between Africa and America, but before it can be decided whether they are of any value in lending support to that theory, it is essential that their past history should be known.

Although we have not much to say in the way of criticism, it may be mentioned that *Elops saurus* (p. 25) has recently been shown by Mr. C. T. Regan to occur only on the American side of the Atlantic, and that there are now three African species of the genus, viz. *senegalensis*, *machnata*, and *lacerta*, the last of which is alone admitted in Mr. Boulenger's volume as a valid species. Then, again, family rank might well be granted to the genus *Chanos*. On the other hand, it is satisfactory to find that the author has recognised the correctness of Dr. Gill's removal of the Kneriidæ from among the Haplomi, and their transference to the neighbourhood

of the Cromeriidæ. Finally, it may be pointed out that in the definition of the Cladistia the item "nostrils on upper surface of snout" is true of all the fringe-finned group, while in the definition of the Teleostei the statement that the supports of paired fins are dermal bones, and not endoskeletal elements, surely seems to stand in need of revision.

The volume is illustrated with a number of text-figures, for the most part of excellent execution, although some of these—apparently on account of the figures having been photographed from lithographs—are not printed so clearly as is desirable.

Mr. Boulenger and the trustees are to be congratulated on the issue of this valuable volume.

(2) Turning to the fishes of Illinois, it has first to be mentioned that the account of these by Messrs. Forbes and Richardson occupies a volume of cxxxi+387 pages of text, this being accompanied by an atlas showing the distribution of each species in the State. We learn from the introduction that the collections and field observations upon which this elaborate monograph are based were commenced so long ago as 1876, and continued, at somewhat irregular intervals, down to 1903. The establishment of a biological station in 1894 on the Illinois River at Havana first rendered it practicable to introduce exact methods of study and observation, such as had previously been impossible, and at the same time enabled the field-work to be conducted with greater regularity and continuity. The quantitative method of investigation, which yielded such good results in the case of the plankton, proved equally successful when applied to ichthyology.

In addition to numerous uncoloured illustrations in the form of both plates and text-figures, the volume contains a large number of coloured plates of Illinois fishes, which are admirable examples of modern colour-printing, and present life-like portraits of the species they portray. The monograph may, indeed, be regarded as a first-rate specimen of the thoroughness and completeness with which biological work is nowadays carried on in the United States, and of the excellent style in which the results are presented to the public.

The volume commences with an elaborate account of the topography and hydrography of Illinois, which is divided into a north-western unglaciated area, the areas of the Iowan and Illinoian drift, the area of the Wisconsin drift, and the unglaciated southern area. This is followed by an equally full account of the river-systems of the State, after which we are furnished with notes on the fisheries of Illinois. All this occupies what may be termed the introductory portion of the volume, paged in Roman numerals, while the remainder is devoted to systematic work.

A total of 150 different species of fishes are recognised in Illinois. In the absence of geographical barriers to their dispersal, the causes influencing their distribution appear to be climatic, geological, and ecological. Geological limitations are indicated in the southern portion of the State by the fact that the area covered by the Illinoian lower glaciation is inhabited by a certain number of species to the exclusion of others. An interesting fact in distribution is afforded by the existence "of a marked difference in prefer-

ence of situation between nearly related species inhabiting the same area, the effect of which is to break the force of a competition between these species such as would prevail if they were similarly distributed ecologically as well as geographically. Closely related species are, as a consequence, often found much less frequently associated in their common territory than either is with widely unlike species of the same geographical range."

The Illinois fishes include the remarkable spoon-beaked sturgeon (*Polyodon*), locally known as paddle-fish, and now valued both for its flesh and as a source of caviare; and likewise true sturgeons, referable to the typical genus, and to the two exclusively American genera *Scaphirhynchus* and *Parascaphirhynchus*. The most interesting of these is the white sturgeon (*P. albus*), which appears to be a very rare species, represented only by about one specimen out of every three hundred examples of the common shovel-nosed *S. platyrhynchus*. Gar-pike and bow-fins form other exclusively American types among the Illinois fauna, and a large number of the genera of "white fish" are likewise solely American. The European perch is, however, represented by a nearly related species, and the same is the case with the bream; but one of the pikes of Illinois is inseparable from the well-known British fish. The authors of this monograph are to be congratulated on having made such an important contribution to the geographical study of fishes.

(3) Congratulations are likewise due to Dr. Günther on the completion of his famous work on the fishes of the South Seas collected for the founders of the Godeffroy Museum at Hamburg. This museum, we may remind our readers, was established by the Messrs. Godeffroy, the well-known Hamburg merchants, for the reception of the natural specimens collected by the officers of their vessels, and Dr. Günther accepted the task of describing the fishes, on the condition, we believe, that a selection of specimens, including all types, should be given to the British Museum. The portions of the work previously published were issued between 1873 and 1881, but for financial reasons the publication came to an end in the latter year. Now, through the generosity of Dr. W. Martin von Godeffroy, the means of completing the work have been provided, and Dr. Günther has, fortunately, been enabled to bring his long-delayed task to a successful conclusion. It should be added that a number of coloured illustrations of the Godeffroy fish collection were prepared by Andrew Garrett, and from these some of the beautifully coloured plates accompanying the present volume have been reproduced.

Since the issue of the preceding part of the work great advances have been made in our knowledge of the fishes of the South Seas, more especially as regards those of the Sandwich and certain other islands; and to correlate this new work with the material in hand required a large amount of investigation. Fortunately, this work could be most effectively done at the British Museum, where a large series of the Godeffroy fishes are preserved, and where also large collections of fishes from the Indian Ocean are available for comparison with those from the South Seas. The result of these investigations and comparisons has been to

produce order and certainty where uncertainty and chaos—as regards the identification of species and the determination of their synonymy—previously prevailed to no inconsiderable extent.

Littoral forms of fish-life occupy a considerable portion of the part now before us, although a section is devoted to flying-fish and other pelagic types; but the deep-sea fishes do not come within the purview of the work. Coral-fishes, or coral-wrasses, of the family Labridæ, are treated in the commencement of the present part, and the brilliant hues and remarkable colour-patterns of these gorgeous fishes are most admirably rendered in the accompanying plates. Our sole regret is that the author appears to have made no attempt to explain the mutual relationships and special purpose of these varied markings. Ichthyologists will greatly appreciate the author's careful revision of the large number of species of flying fishes inhabiting the South Seas; but students of the habits of animals will perhaps regret that Dr. Günther has maintained a cautious reserve with regard to the manner in which these fishes perform their aerial flight. Both the "aëroplane" and the "vibration" theories are mentioned, with references, but the author does not give even a suggestion as to which he considers to be the more probable explanation.

With the bare mention that no new species are described, we repeat our congratulations to Dr. Günther on the completion of his long-deferred task.

R. L.

#### OUR BOOK SHELF.

*Further Advances in Physiology.* Edited by Leonard Hill, F.R.S. Pp. vii+440. (London: E. Arnold, 1909.) Price 15s. net.

THIS is the second volume of original articles issued under the editorship of Mr. Leonard Hill. The first appeared about three years ago, and was reviewed in NATURE, May 3, 1906. That the publishers have seen fit to issue a second volume is an indication that the first was a success. The present volume treats of a number of interesting and important questions which have recently been subjects of research among physiologists, and the senior student is thus provided with a summary of the latest views which otherwise it would have been impossible for him to have obtained without much labour and exploration in many journals. The idea of the book is thus excellent; one's only fear is that in the presentation of a good deal of controversial matter even the best of students may sometimes lose himself and wish there was more agreement among physiological workers. In some of the articles more attention is paid to points of difference than to points of agreement, and general conclusions to help the reader in the maze are not always forthcoming. On the other hand, from the point of view of the researcher, the descriptions given of recent work are too fragmentary in some cases to be of any real help, though perhaps this may be wise, for anything which tempts the original worker to neglect reading the actual writings of his predecessors on the same road is to be deprecated.

The articles contained in the book are the following:—Prof. B. Moore opens with a consideration of the equilibrium of colloid and crystalloid in living cells; Mr. M. Flack comes next with an article on the heart, in which, *inter alia*, he discusses the *pros* and *cons.* of the myogenic and neurogenic theories; Dr.

T. Lewis deals with pulse records in relation to the events of the human cardiac cycle; the editor advances his heterodox views on the part played by blood-pressure on such phenomena as lymph production and secretion; Dr. A. Keith contributes an anatomico-physiological article on the mechanism of respiration; and Dr. M. S. Pembrey an extremely useful essay on the physiology of muscular work; the problems of growth and regeneration of nerve, and the nature of the nerve impulse, are then considered by Dr. N. Alcock; Dr. J. S. Bolton treats of cortical localisation, and Marie's views on Broca's aphasia are described; and the volume concludes with an article by Mr. M. Greenwood on visual adaptation and colour vision.

The mere enumeration of the subjects treated indicates the wide-reaching interest of the book, and the names of the authors are a sufficient guarantee that the work is well done.

*Weltsprache und Wissenschaft. Gedanken über die Einführung der internationalen Hilfssprache in die Wissenschaft.* By L. Couturat, O. Jespersen, R. Lorenz, W. Ostwald, L. Pfaundler. Pp. iv+83. (Jena: Gustav Fischer, 1909.) Price 1 mark.

THAT an international language for scientific communication is desirable no one will question; that an artificial language will ever be generally adopted for such a purpose is more than doubtful. If success in this direction is to be attained, it will probably be on the lines indicated in the present pamphlet, which is a kind of unofficial manifesto of the "Délégation pour l'adoption d'une langue auxiliaire internationale" appointed in 1900. A commission including scientific and linguistic experts of different nationalities is more likely to devise an acceptable language than any individual, who of necessity suffers from the prejudice of his mother-tongue and a comparatively limited knowledge of the requirements of the new medium. After seven years' deliberation, the international delegation has adopted most of the principles of Esperanto, but with great modifications in detail.

For Europeans and Americans the fundamental requisites of a common artificial language are:—(1) a simple phonology and alphabet, only such sounds being admitted as are in actual use amongst all the principal European peoples (exclusion of English *w* and *th*, German modified vowels, French nasals); (2) a vocabulary composed, as far as may be, of words comprehensible at sight to cultivated Europeans; (3) as little grammar as possible. These principles are generally followed in the new language "Ilo," the Slavonic peculiarities of Esperanto (e.g. the circumflexed consonants and absurd terminal *j*'s) being carefully avoided. The vocabulary has a distinctly Romanic appearance, and grammar is reduced to small proportions, which might with advantage be smaller still. Word-formation from stems by means of prefixes and suffixes is systematic, but needlessly complicated. Why should we, for example, have the prefix *bo-* to indicate relationship by marriage? "Father-in-law" = *bopatro* is not a necessary word; "wife's father" or "husband's father" is equally simple and more definite. Again, to use *-isto* for "professional" and *-ero* for "amateur" is making a rather superfluous distinction. It may be convenient occasionally to distinguish between *fotografisto* and *fotografiero*, but in the case of, say, *dentisto* and *dentiero* the necessity is not so obvious.

Notwithstanding its shortcomings, "Ilo" is a great advance on its predecessors, and men of science who are interested in the general scheme may be cordially invited to join the "Uniono di l'amiki di la lingvo internaciana." But for the general adoption of the language much enthusiasm will be needed, and it is